Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE PASTEUR TREATMENT.

BY DR. PAUL GIBIER, DIRECTOR OF THE NEW YORK PASTEUR INSTITUTE.

WITHIN a few years, thanks to Pasteur's important labors, the question of rabies has been so thoroughly agitated that it is somewhat difficult to discuss the subject, especially in a periodical like this REVIEW, without exposing one's self to utter commonplace, instead of presenting to the reader facts altogether unknown to him. However, owing to the general attention that has been attracted to the subject by the method of preventive inoculations, some data upon experimental rabies have, important though they are, remained in the background, and I will endeavor to explain them briefly before entering upon the study of the method I have just spoken of.

In the first stage of the history of that mysterious disease, rabies, we run against a mystery : why is not the period of incubation the same in all individuals? Some die fifteen or twenty days after having been bitten, whereas others meet their fate only after a few months or even a few years. One case in which the incubation lasted two years has been reported.* In the midst of the long and numerous experiments which the writer of these lines has performed upon rabies, there have occured, in cases in which the inoculation was performed upon the skin by means of incisions made with the lancet, some observations on rabbits in which the incubation varied from eighteen days to nine months.

As to the microbe which must, as in every contagious malady, be present in the substance whose constant virulency is admitted, —that is to say, the nervous substance,—its official existence has not as yet been recognized, although since 1883 I have at length described and drawn it, showing at the same time the proper means for placing it in evidence. The principal peculiarity of this germ is that we have as yet been unable to stain it, as may be done with other microbes. Neither can it be cultivated in an inert medium.

---

* Féréol (Union Médicale, 1874) cites a case in which the incubation lasted two years and a half; Colin (d'Alfort) another case in which two men, bitten by the same dog, died respectively forty days and *five years* after. (Ann. d'Hygiène Publique, 1881.)

Finally, in order not to prolong unduly this part of our study, let me say that the manner in which this terrible disease behaves as to its termination, and according to the kinds of animals affected, is also a matter for wonder. In fact, though we may assume that many bitten individuals have a latent rabies which passes away unperceived and is cured,—preventive inoculations serve well to prove the possibibility of this,—I know of no authentic case of manifest rabies that has been cured in man.* On the other hand, instances are not absolutely rare in which dogs have returned to the normal state after having shown unequivocal signs of rabies, and even after having communicated it to other animals. Further, I have experimentally demonstrated that birds, and notably hens, which contract rabies, may communicate it to mammifera, to which it will prove fatal, though the hens will spontaneously recover. In cases among birds attacked with rabies in which death appears to be imminent, owing to a very powerful infection, and when the paralysis is strongly marked, it is yet possible, as I have demonstrated, to prevent the fatal issue by feeding the bird by means of a tube which is inserted in the upper alimentary passages. My researches have, moreover, furnished the first experimental proof that rabies did not occur a second time, as I showed that the birds which had once been cured were unable to contract the malady a second time, even after a year, if inoculations were again performed on them.†

We have already seen that the incubation varies considerably as to duration; I must state as briefly as possible how the data of observation joined to those resulting from experiments are able to provide an explanation for this apparently-contradictory fact. After the rabic virus has been deposited upon the tissues that have been lacerated by a bite, one of two things may take place: either the virus remains on the wound, or it is carried into the general circulation by some torn blood-vessel (commonly a vein). In the first case it may happen that the phagocytes (Metchnikoff) destroy the microbes, and no rabies occurs ; but more frequently the germs, coming into contact with torn nerves, are developed within the central portion (myelaxis) of these organs, and thence are propagated as far as the nervous centres. This way had been theoretically indicated by several authors,* but lately it has been demonstrated by exceedingly ingenious experiments † This may well explain the long duration of some incubations, for the march of the virus—that is to say, the development of microbes—may take place at first, and there only, in a minute nervous fibre whose cells offer a more or less important resistance to the invading germs, and before being able to reach the medulla and cerebral centres the journey's length must vary according to the distance from the inoculated spot to the medulla or the brain. This offers an explanation of the shortness of incubation observed in wounds of the head and face, as well as its longer duration when the limbs, and especially the lower ones, have been bitten.

---

* However, I may say that among fifty observations of hydrophobia reported in *The Lancet* of March, 1890, by Dr. Lucas Benham, a certain number seem to have been genuine cases of hydrophobia.

† Académie des Sciences, C. R., Paris, 1883-'84-'85.

If the absorption takes place through a blood-vessel or a lymphatic, it is easily understood that the incubation will not be of a much greater duration than in those cases in which, for experimental purposes, the rabic virus is injected in the veins of an animal. In this event the duration is independent of the situation of the wound. This mode of infection doubtless occurs chiefly in those lacerations which bleed abundantly.

However this may be, the incubation seldom lasts less than three weeks ; it generally lasts much longer. It was the knowledge of this fact that suggested to Pasteur the idea, which has since proved so useful, that if one could render an animal refractory to rabies by means of injections of attenuated virus, it might doubtless be possible to produce this very state during the interval which separates the time of biting from that of invasion. This having been demonstrated in animals, it only remained to display sufficient audacity to make its practical application upon man.

I believe that the best means of giving an idea of the value of the preventive method devised by the eminent scientist is to state as briefly as facts will allow the results which have been obtained in the last few years by means of the inoculations that have been performed on a good many thousand people.

---

* Duboué (de Pau) Physiologie, etc., de la Rage. Brown-Séquard in Holmes's 'System of Surgery," London, 1870.

† Di Vestea and Zagari, Giorn. internaz. di Scienze Med. IX., Naples, 1887; *Idem*, Nouvelles expériences, Annales de l'Institut Pasteur, 1889; Roux Ann. Inst. Pasteur, t. II. No. 1., t. III. No. 2.

At the time of the opening of the Pasteur Institute in Paris, more than a year ago, the statistical situation was as follows: The inoculations had only been generally performed since the beginning of 1886. From that time until July, 1888 (thirty-six months), the number of persons inoculated at the Pasteur Institute at Paris was 5,374; an average of about five people daily. The official total of the mortality during this period, including all deaths, even of those who contracted rabies before the treatment was completed, was 1.34 per cent. for 1886. For 1887 it was 1.12 per cent., and in 1888, 0.77 per cent. But admitting that if, when death occurs within the fortnight which follows the treatment, it was because the nervous centres were already invaded by the virulent morbid germs when the treatment began (and this fact necessarily rendered it inefficacious), we obtain a diminution which lowers the total mortality, notwithstanding treatment, to 0.93 per cent. for 1886, to 0.67 per cent. for 1887, and to 0.55 per cent. for 1888. The decrease which is observed in the succession of years must be attributed to the gradual perfecting of the method. A method known as "intensive," by which a less attenuated virus is injected, or, rather, a larger quantity of the virulent liquid, than was done at first, has been substituted for the primitive method, and this practice, which is based upon experimental investigation, seems, by its successive developments, likely to bring about a mortality of 0 per cent. when the treatment begins in proper time.

Here are a few compilations from the statistics derived from various institutes founded on the principle of the Pasteur Institute in Paris.

In St. Petersburg, whére, thanks to the generosity of Prince Alexandre of Oldenburg, an anti-rabic laboratory has been founded, 484 people were vaccinated during two years and two months (July, 1886, to September, 1888). The severity of the bites, which had in many cases been inflicted by rabid wolves, caused a rise in the mortality, which amounted to 2.68 per cent. This number, however, is far from the average of 80 per cent. of deaths which occur when the bitten persons are not treated.

In Odessa, 324 persons were vaccinated in 1886 by the primitive method (simple treatment). The mortality was 3.39 per cent. But in 1887 and 1888, 709 persons submitted to the intensive treatment, and the mortality was lowered to 0.60 per cent.

In Moscow the institute was founded by Prince Dolgoroukow. One hundred and seven persons were vaccinated in 1886 with the simple treatment. The mortality was of 8.40 per cent. But in 1887 and 1888, the intensive treatment having been substituted, the mortality among 526 fell to 1.45 per cent.

In Warsaw, out of 370 people treated by the new method, not a single death occurred.

In Milan, 335 were inoculated; deaths, 0.60 per cent.

In Palermo, 109 inoculated ; no deaths.

In Naples the anti-rabic laboratory had been closed for lack of subsidies ; but nine deaths from hydrophobia having occurred in the town, the government and the city did what was needed to place the institute in working order ; 246 persons were inoculated in a short time ; mortality, 1.5 per cent.

In Havana, where my friend Dr. Santos Fernandez, assisted by Dr. Tamayo and a pleiad of brilliant workers, has established an anti-rabic laboratory, out of 170 people who were bitten and inoculated, the mortality was only 0.60 per cent.

Finally, in Rio Janeiro, where Dom Pedro II. encouraged the establishment of a splendid institute, fifty-three persons have been inoculated within a short time, without a single death.

It would be needless to resume for 1889 the series of statistics which have been considered for the years 1886-'87-'88, and which are now of a value acquired by the time that has elapsed. If we consider that the perfected methods are applied by hands which are becoming better and better trained, it will not be surprising if these satisfactory results continue and become even more favorable. In a recent communication M. Pasteur has been able to say, with a legitimate sense of satisfaction, that among the last thousand inoculations that have been performed in his institute, there had not occurred a single unsuccessful case. This, in numbers, may be put down as follows : mortality, 0 per cent.

Scientific England has been one of the first countries to accept the new doctrine of germs in the production of diseases, and every memory recalls the thankful letter sent by Sir J.

Lister to Pasteur after the marvellous results obtained by the antiseptic method which the English surgeon, inspired by the labors of the great French biologist, had inaugurated in his Edinburgh clinic. The same is true of the prophylaxis of rabies: I only wish to recall the report of Mr. V. Horsley, the eminent physiologist, who, in the name of an official commission composed of the principal scientists of England (among them Sir J. Paget), recently declared that "Mr. Pasteur had discovered a method preventive of rabies that was comparable to vaccination against variola." England has been one of the chief subscribers to the Pasteur Institute of Paris, where a number of British subjects are daily cared for.

I will devote but a few words to the technique of the successive operations required for the preparation of the anti-rabic vaccine.

The vaccinal matter consists of fragments of the spinal cord of a rabbit killed by hydrophobia, which are progressively desiccated at a fixed temperature and in the dark. Every day a fragment of the substance thus prepared is injected, but every time a less dried specimen is employed: this is equivalent to saying that every day the injection is made with matter that is coming nearer and nearer to the normal virulent state, to which the body is thus gradually accustomed. There is scarcely any need of adding that a thorough knowledge of bacteriological technique is indispensable in all the operations through which pass the inoculating materials: otherwise the most fearful accidents might suddenly supervene.

But how is brought about this condition which causes the body to become resistant to a living poison which in ordinary circumstances would cause its death? To remain within the bounds of the question that now occupies us, here are the differences between the two chief theories: according to one, the microbe secretes a vacciniferous substance; the nervous system gradually becomes accustomed to the effect of this secretion, and becomes able to resist the microbe, producer of this substance, when the latter is brought in contact with it. Towards this theory Pasteur seemed to lean at the start. But experimentation, let us say at once, would seem to give support to the other theory, which may be formulated as follows: the nervous system is able to resist the virulent microbe only when it has been brought into contact at first with a small number of these same microbes in an attenuated, weakened state. The success of the method known as the "intensive" one, besides the experiments made upon animals, which our limited space does not allow us to describe here, would seem to favor the latter mode of explaining the production of immunity against rabies.

Let me say, before closing, that with the aid of the subscriptions which have been made towards the work of M. Pasteur, an institute for the purpose of studying general and special bacteriology has been erected in Paris. As regards size and convenience, this institute is unique, and from all parts of the world physicians, naturalists, and scientists generally come to be initiated in the methods which the master first devised, and which his disciples have perfected in various ways. I hope no one will see in my description any idea of "nationalistic" pride. I am merely proud, as a man, to recognize to what a degree of perspicacity, of ingenuity, and of science the human genius can rise—that is all. I believe, nevertheless, that I have kept myself far below the praise and the marks of admiration that are deserved by the work of my illustrious countryman and master.

PAUL GIBIER, M.D.